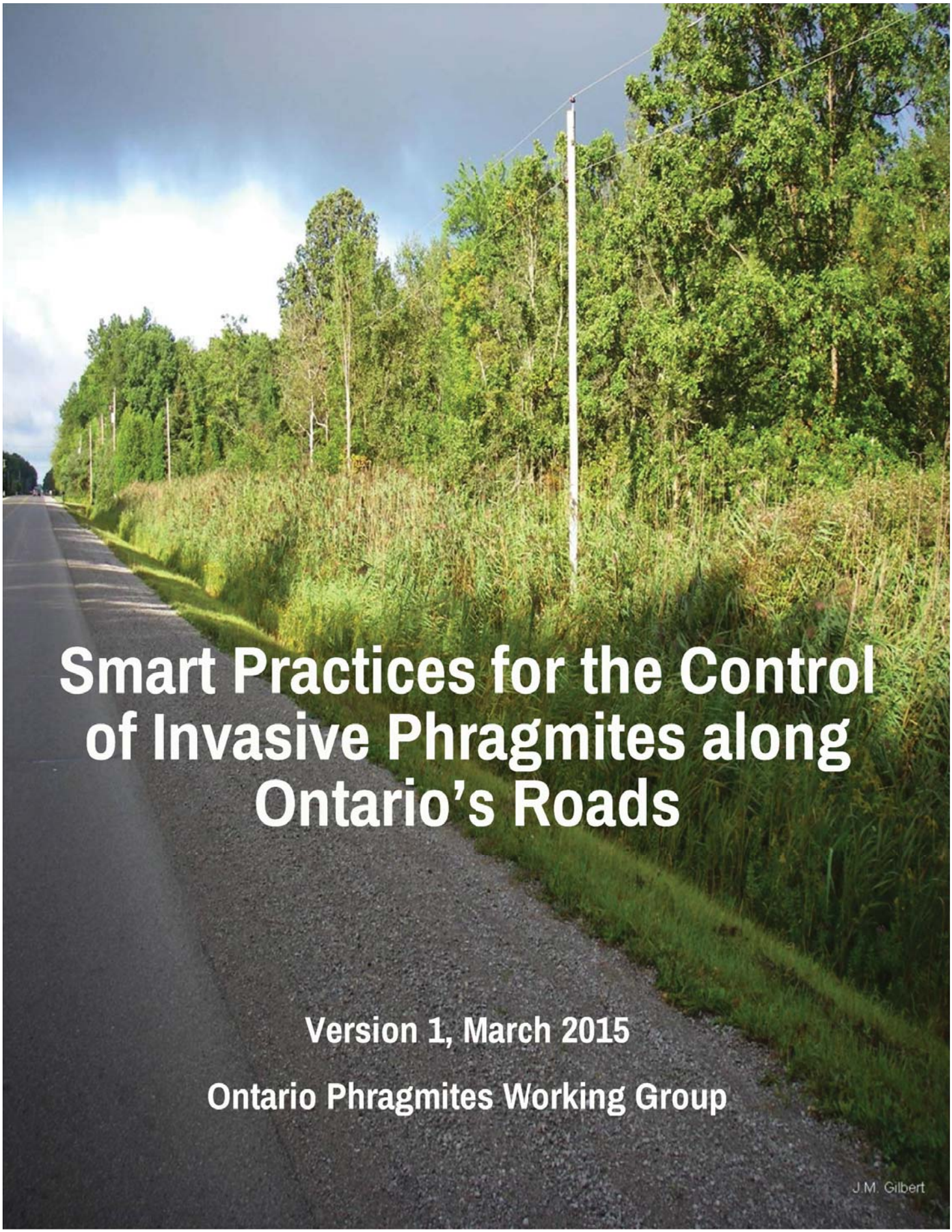

Smart Practices for the Control of Invasive Phragmites along Ontario's Roads

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Ontario Phragmites Working Group

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Photo Credits J.M. Gilbert, J. Swearingen, Mary Gartshore, Dover Agri-Serve, Green-Stream, Paul Catling and Gisele Mitrow

* Note this is a 'living document' containing the most current information available and will be updated as new information emerges.

TABLE OF CONTENTS

INTRODUCTION

This document was developed to help guide effective and efficient roadside ditch control of the invasive *Phragmites australis* (European Common Reed).

Phragmites (*frag-MY-tees*) is an aggressively spreading grass that can reach heights of more than 5 metres and densities of over 200 plants per square metre. In 2005 it was recognized as Canada's worst invasive plant by scientists at Agriculture and Agri-food Canada. Since then it has spread throughout Ontario and become one of the most significant threats to Great Lakes coastal habitats, where it has drastically reduced plant and animal diversity and threatens a high number of Species at Risk (SAR).

Negative impacts on humans include reduced shoreline access, reduced recreational opportunities, reduced aesthetic enjoyment, reduced shoreline property values and increased hazards due to fire, and blocked site lines at road intersections. Phragmites is rapidly becoming problematic for interior wetlands and riparian corridors. Negative effects on agricultural lands due to blocked drainage ditches is also increasing, as is damage to asphalt roads from rhizomes, and threats to hydro transmission from standing dead biomass catching fire.

Recent studies have identified roads and other transportation corridors along with the movement of infested heavy equipment as the major conduits for spread. Currently Ontario lacks the coordinated and unified approach that is required to effectively deal with Phragmites and curtail its rapidly increasing distribution. However, local control programs are underway in a number of Ontario's municipalities and by the province. The knowledge obtained through these efforts has been summarized in this document to provide guidance to other communities looking to undertake similar actions.

This information is intended to help reduce ineffective activities being undertaken, mistakes being repeated and valuable funds and resources being wasted. The most important message is that **Phragmites must not be ignored**. Established Phragmites cells can expand at an exponential rate and will eventually become problematic. The quicker an infestation is dealt with, the easier and less costly it will be to manage. The intent of those who contributed to the development of this document is that all communities throughout Ontario will become aware of the threat Phragmites poses, and become engaged in effective Phragmites control efforts.

Definitions

Municipal Drains	A system of engineered drainage works typically established to improve drainage issues generally within private lands of one or more land owners. They are created under the authority of the *Drainage Act* and are managed by the local lower tier municipality, but not Counties or Regions. (Reference: *Drainage Act* RSO 1990, Chapter D.17)
Roadside Ditches	A system of channels, some open, some piped, adjacent to municipal roads that are designed to resolve road drainage issues only, not those of adjacent private lands. They are maintained and controlled by the municipality that has jurisdiction over the abutting road.

WHAT DOES INVASIVE PHRAGMITES LOOK LIKE?

Phragmites australis is a robust perennial grass capable of developing into large mono-dominant stands.

Figure 1. Large monotypic Phragmites cell in a Lake Erie coastal wetland.

Mature plants have long, brittle stalks with broad, flat, leaf blades starting halfway up the stem, and a dark purple or blonde plume that be quite large and contain thousands of seeds.

Figure 2. Mature Phragmites with purple and blonde seed heads on the Lake Huron shoreline.

The stalk tends to be yellowish brown and rough but in certain conditions, it can also appear smooth and red tinged much like native Phragmites.

Old stalks are resistant to decay and can remain standing for several years.

Below ground the rhizomes and roots form a dense, thick mat that can be several metres thick.

Figure 3. Exposed invasive Phragmites rhizomes and roots along the Shawshawanda Creek at Kettle Point, Lake Huron.

Stolons (i.e. above ground *runners* that produce new plants) can also be present and have been observed as long as 39 m with new shoots emerging approx. every 30 cm.

Figure 4. Stolon with numerous new shoots emerging from a parent invasive Phragmites plant, northern Lake Huron wetland.

Pioneer populations are much smaller in size and are often overlooked or not seen as a threat. At this stage the plants could be confused with other grasses and care must be taken to ensure proper identification. However, this is the best stage to initiate control.

Figure 5. Invasive Phragmites just starting to colonize a beach on Lake Huron.

Two of the best features for positively identifying invasive Phragmites are *glume* length (i.e. husk) (Figure 6) and *ligule* (i.e. tuft of hair-like membrane where the leaf meets the sheath) width (Figure 7).

More identification information can be found on the Ontario Phragmites Working Group's website www.opwg.ca/index.php/about-us

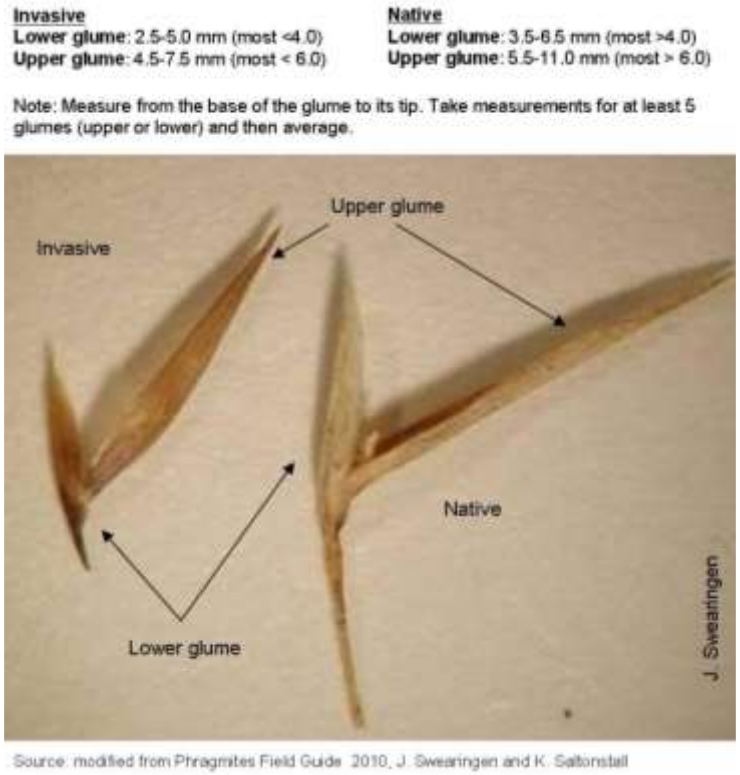
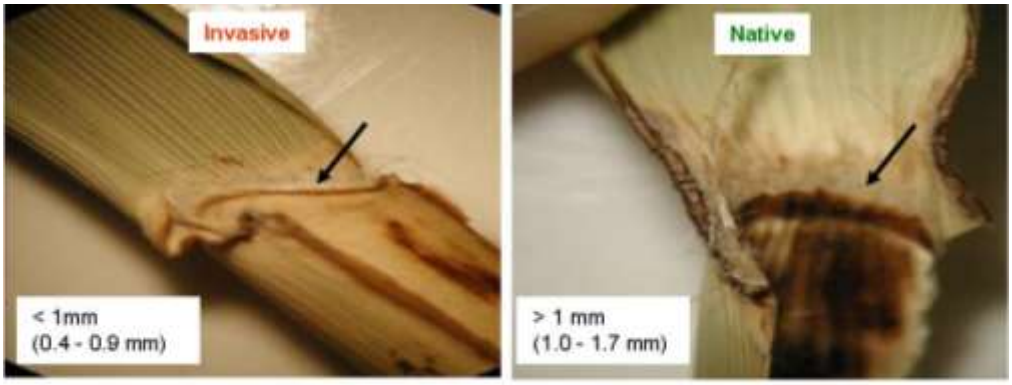


Figure 6. Comparison of glume lengths between invasive and native Phragmites.



Source: modified from Phragmites Field Guide 2010, J. Swearingen and K. Saltonstall

Figure 7. Comparison of ligule width between invasive and native Phragmites.

HOW DOES PHRAGMITES SPREAD?

Phragmites colonizes new sites via seeds, rhizomes, stolons and stem dispersal.

Seeds can be dispersed by winds, up to a 10 km radius. Seed germination rates tend to be low, but this increases where plants are growing in high nutrient conditions.

Figure 8. Germinating invasive Phragmites seeds found floating in the Detroit River.

Seeds only remain viable for one growing season and therefore do not accumulate within the seed bank like many of our native plants. Seeds, rhizomes, stolons and stems can be dispersed by flowing water. (Figure 9)

Figure 9. New shoots emerging from an invasive Phragmites stalk found floating in Sturgeon Creek, Leamington, ON.

Disturbed sites (e.g. from construction) are the most vulnerable to colonization, however even small open, moist patches within undisturbed areas can become colonized.

Humans are the main cause of Phragmites spread, moving it throughout the province via **contaminated heavy equipment**.

Spread of Phragmites throughout coastal habitats and into remote regions is also increasing due to **all terrain vehicles and other off road vehicle use**.

Once plants become established, expansion is exponential via stolons and rhizomes.

WHY ARE WE CONCERNED ABOUT THIS INVASIVE PLANT?

1. There are no natural competitors to keep Phragmites in check.
2. Phragmites is a strong competitor for nutrients and can survive, and even thrive, in a wide variety of conditions.
3. Phragmites releases chemicals from its roots that harm other plants.
4. Its typical growth habit is to develop into dense, mono-culture cells, even where it grows naturally in Europe.

5. Native plant species cannot effectively compete against Phragmites which severely alters native habitat complexity and diversity.

6. Native wildlife may use the **edges** of a Phragmites cell, but the interior sections are effectively dead zones.

7. A high number of Species at Risk are negatively impacted by Phragmites.

8. Phragmites can grow so tall and thick that cells become barriers along shorelines, greatly affecting recreational access, aesthetic enjoyment and property values.

9. Phragmites development on sandy shorelines alters sand movement, resulting in wet swales where mosquitoes can thrive.

10. During the dormant period, the standing dead biomass presents a significant fire hazard to infrastructure and residential areas.

11. Phragmites plugs agricultural drainage ditches and tiles creating flooded conditions and impacting crop yields.

12. Phragmites blocks sight lines along roads creating safety hazards to motorists and pedestrians.

CURRENT CHALLENGES TO PHRAGMITES CONTROL EFFORTS

1. An effective province-wide public education campaign about invasive Phragmites is currently lacking.

2. Effective tools (over-water safe herbicides) for the control of Phragmites in wet sites are lacking.

3. Solid coordination is required between municipal road authorities and the province to deal consistently with Phragmites along road corridors, which will mark significant progress in the control of further spread.

HOW TO CONTROL PHRAGMITES

Start by Educating the Public

A proactive approach is needed to educate the community - the use of herbicides may be questioned. Stress why control is important — e.g. Phragmites will clog storm culverts and drains, present a safety hazard (fire hazard and blocked intersections) and, if left untreated, it will cost taxpayers. Controlling the spread vectors will also protect the province's wetlands.

Information can be shared with the public by mail: e.g. a notice in local tax bills, or general mail to property owners selected by postal code.

Work with partners such as the Conservation Authorities, municipalities, and home or cottage associations to arrange Community Information Sessions.

Engage local newspapers to provide information about the plant, why control is important and to inform the public when maintenance work is about to take place.

Post signs in areas where work is being done to inform the public of local control efforts, e.g. *Invasive Species Control*, or *Natural Habitat Restoration*.

Provide contact information and links for further information:

Ontario Phragmites Working Group www.opwg.ca

Ontario Invasive Plants Council www.ontarioinvasiveplants.ca

Ministry of Natural Resources and Forestry
www.web2.mnr.gov.on.ca/mnr/Biodiversity/Invasive_Species/Phragmites_Fact_Sheet.pdf

Ontario e-laws for the full text of the Pesticides Act and Reg. 63/09
www.e-laws.gov.on.ca

Local municipal websites

Build Partnerships

An effective Phragmites control program must engage all property owners, managers and stakeholders. It is not effective to control Phragmites only within municipal drains unless similar efforts are concurrently undertaken along municipal and provincial roads, as well as on adjacent privately owned properties.

Identify Phragmites Sites

Begin your local control program by mapping the locations of Phragmites cells in your area. Identify property ownership, for management purposes and to determine control costs. This will help you to identify where partnerships need to be established, and to prioritize control efforts. This information can also be used to track the success of your control program and inform managers about annual budget allocation needs. We recommend that you keep a photographic record of local Phragmites sites to help monitor the progress of your control program.

If a Letter of Opinion is required for permission to apply herbicides, Phragmites locations need to be identified and included in the application.

Road crews can track Phragmites locations while carrying out routine road inspections and maintenance operations.

Valuable information to collect includes:

- Precise cell location (GPS, latitude/longitude)
- Which side of the road is the cell on
- Approximate size of cell (length x width)
- Cell density (sparse, medium, high) and height of plants
- Have plants spread beyond the road allowance? If so, describe in detail
- Site description. e.g. road right-of-way, farmland, wetland, beach or waterfront, residential, industrial, school zone, parkland, under hydro transmission lines
- Any potential issues with control, e.g. traffic volume, steep slopes, obstructions, access barriers, crops, lawns, golf courses, parks, flooded conditions

An annual patrol program should be in place to allow for early detection and rapid response of pioneer populations.

Prioritize Treatment Locations

If the Phragmites locations cannot all be treated in the same year due to resource constraints, give priority to:

- cells blocking sight lines, or otherwise causing hazardous conditions
- cells located in close proximity to wetlands, creeks, streams, rivers, lake shores, or other sensitive, high value areas
- cells located within an area where multiple partners are working cooperatively
- cells located in areas where signs can be posted to increase public education, awareness and support
- cells threatening infrastructure due to fire hazards, damage to pavements, and blocked drainage

Site Specific Control Considerations

1. Timing of Treatments

- Regardless of the control method selected, it is important to note that animals, including nesting birds, turtles, frogs, toads or snakes, may be present. Control activities should be timed to reduce potential harm or mortality to wildlife.

- Birds will nest in the standing dead stalks from previous year's growth. Cutting or flattening these stalks before spring will reduce the potential for nest establishment while also improving control efficiency.

- Wet ditches tend to have more amphibians and reptiles and cannot be treated with the currently available herbicides or cut as easily. Wait until these ditches dry out to reduce potential harm to wildlife and increase control options and efficiency.

What's the best time for Phragmites control? Mid-summer to late fall.

2. Control Options

The 3 options for controlling Phragmites are:

- Cutting
- Applying herbicide
- Combination of cutting + herbicide

Herbicide treatments are the most effective.

Control Options

- Cutting
- Herbicide
- Cutting + Herbicide

Herbicide is the most effective method.

Only licensed exterminators may apply herbicides in Ontario.

Timing of Herbicide Application

1. Any time after Phragmites plants have reached 1.5 m. (late spring to mid-fall). June to August is ideal.

2. Wait at least 3 weeks after spraying before cutting to allow time for the herbicide to work.

3. Roll or cut dead biomass (i.e. standing stalks from the previous year) before the growing season to ensure the herbicide reaches live plants.

Do not spray if the plants are wet with dew or rain.

Do not spray when temperatures are either too cold or too hot.

Cutting

- Cutting alone will not kill Phragmites, but it may slow growth, reduce stand density and reduce seed head development.

- If this method is selected as the control option, a regular cutting regime must remain in place in perpetuity, as the plants can grow quite rapidly, and dense cells will re-establish once cutting discontinues.

- In areas where conventional riding mowers are currently being used, Phragmites will need to be cut in the spring before it reaches a height that prohibits mowing. These sites will require frequent cutting throughout the growing season, as Phragmites growth is fairly rapid even during hot, dry periods.

Figure 10

Herbicide Application

Only Integrated Pest Management (IPM) certified operators may apply herbicides in Ontario, as per Reg. 63/09 and the Pesticide Act.

With proper timing, concentration and application methods, Phragmites can be brought under control using herbicides effectively, efficiently and environmentally responsibly.

Currently only two products are legally available in Canada to control *Phragmites australis*:

- WeatherMAX® (registration No. 27487)

- VisionMAX® (registration No. 27736).

Important: neither product can be applied over water.

The recommended concentration of these products for the control of Phragmites is 4.5% - 5%.

It is highly recommended that the surfactant MSO Concentrate Methylated Seed Oil also be added at a 1% concentration to increase plant uptake and improve herbicide effectiveness.

Commercial name: Adjuvant® Active ingredients 70% methylated soybean oil, (registration No. 28385)

Herbicide Application Methods

The most common application methods for herbicides are

- Spraying
- Wicking
- Wet Blade™

Choosing the most appropriate method depends on the characteristics of the site, as well as the logistics of the overall management plan for the area. Each site will dictate the appropriate nozzle type and pressure. Even though the herbicides are broad spectrum spraying lower density stands is recommended since less chemical will be required and native species often respond well and will re-establish once the invasive Phragmites is killed.

1. Hose and Handgun Applicator

This application method uses a medium size spray system that fits in the back of a pick- up truck, typically using a 950 litre tank with a motor and pump system that sends the product to a 300 ft. hose reel with an appropriate spray gun and nozzle. This method enables the operator to walk and isolate Phragmites stands that are not easily accessible from the roadside.

2. Boom and Boom-less Applicators

This application method uses larger spray systems that are custom made for a cab and chassis truck. Typical tank sizes are between 2,840 - 11,360 litres. Large booms can reach out and specifically target large stands of Phragmites from the road edge, while not harming desirable plants. These systems typically utilize spray monitor systems and direct injection systems in order to apply the appropriate amount of herbicide while keeping application records. GPS tracking is also available to this equipment.

3. Wet Blade™ Applicators

Figure 11. A Diamond WetBlade™ system.

This application method uses a combination of mowing and wiping. Herbicide is not sprayed onto the Phragmites, instead it is directly applied to the freshly cut Phragmites stem at the same time it is cut. The system ensures that the blade is constantly and completely wet with herbicide. Herbicide delivery is concentrated and precise, with no leaching, no drift and virtually no buffer restrictions, which increases the amount of Phragmites that can be controlled.
This method is especially valuable in areas where broadcast spraying of herbicides is not possible, or where there are open water body sources or if the application area is close to livestock pasture areas. Also, because no atomization of the herbicide occurs, there is virtually no drift, allowing the WetBlade™ application system to be used in windy conditions.

While this system continues to undergo refinements to increase its effectiveness, currently it has a much lower control efficacy compared to use of conventional spray equipment. This means that the same cell may need to be treated four to five years in succession before 100% control can be attained.**Timing for herbicide application**

Figure 12. Steve Ford (Green Stream) controlling Phragmites on a section of Highway 403 using WetBlade™ equipment.

The window for Phragmites control using a herbicide occurs between late spring, when plants are approximately 1.5 m in height until late fall, when the first heavy frost causes significant die off. Surface water and habitat usage must be taken into account when planning herbicide applications.

Wildlife is rarely observed in the centre of large *Phragmites* stands, but is commonly observed in smaller, narrower stands, or at the edge of stands. Depending upon the type and density of wildlife usage, controlling Phragmites with herbicide may be best left for late summer or fall when young animals are mobile and wildlife usage is generally far less.

Here are some timing guidelines:

1. Any time after the plants have reached at least 1.5 m in height, when there tends to be sufficient leaf surface for herbicides to work, and up until mid to late fall. (i.e. when natural *senescence* takes place (i.e. natural die off). Plant growth responses are driven by weather and site specific conditions.

   A rain droplet spray nozzle can be used to increase herbicide application accuracy and reduce spray drift when necessary.

2. Do not spray if the plants are wet with dew or rain.

3. Do not spray when temperatures are either too cold or too hot, since plant adsorption of the active ingredient is significantly reduced as is plant metabolism.

Figure 13 Boom sprayer treating roadside stand of Phragmites. Photo courtesy of Green Stream.

4. If plants are to be treated before they reach full height it is highly recommended that the standing dead biomass (i.e. stalks from the previous year) be flattened or cut before the growing season, to increase herbicide contact with live plants and reduce product waste.

5. Allow at least three weeks after herbicide application before cutting or removing plants to ensure the chemical has time to shut down the below-ground structures.

Depending upon the density of the stand and weather conditions, mortality rates of between 70 – 95% can be expected after one treatment.

For most Phragmites cells, complete control can be expected after two treatments.

Depending upon the site conditions, control can be undertaken using conventional equipment such as boom sprayers.

Figure 13. Frank Letourneau (Dover Agri-Serve) using a boom sprayer to control invasive Phragmites along a road in Chatham-Kent.

Large or more difficult to access cells can be controlled using retrofitted all terrain vehicles such as the one shown below.

Figure 14. Frank Letourneau (Dover Agri-Serve) using a retrofitted Centaur™ to control invasive Phragmites located within difficult- to-access terrain.

Seed head prevention

- Cutting Phragmites plants between July and mid August will prevent seed head development
- Applying herbicide before mid to late August will kill plants before they can produce viable seeds. There is some indication that herbicide application after seed head set may also reduce seed viability

INEFFECTIVE CONTROL METHODS

- Cutting Phragmites will help to curtail stand density and plant rigour, but this will not kill the below-ground structures. Once a cutting program is discontinued Phragmites will re-establish.
- Cutting only a portion of a cell will not curtail spread or stand establishment.
- Cutting plants after they have developed viable seed heads increases spread.
- Using a lower concentration of herbicide than what is recommended may only make plants sick, reduce efficacy and could result in resistance to *glyphosate*, the active ingredient.
- Not applying the herbicide at the correct time, or under the proper weather conditions, reduces efficacy and ultimately increases herbicide use, efforts and cost.
- Targeting only a portion of a Phragmites cell with herbicide is ineffective, wastes funds and will increase the required use of herbicide.
- Cutting Phragmites before herbicide application, or too soon after herbicide application, significantly reduces effectiveness.

Control Methods That Don't Work

1. Cutting without use of herbicides.
2. Cutting only some of the Phragmites cell.
3. Cutting the plants after a seed head develops.
4. Using a lower concentration of herbicide.
5. Applying herbicide at the wrong time or not under proper weather conditions.
6. Only treating some of the Phragmites cell
7. Cutting before or too soon after applying herbicide.

PERMITS REQUIRED FOR HERBICIDE USE

In Ontario, herbicide storage, disposal, use, transport, and sale are regulated under the *Pesticides Act*, and Regulation 63/09. Contact the Ministry of the Environment and Climate Change (MOECC) for further details about the requirements for using herbicides. As the owner of a public right-of-way, you will also need to make reports available for public viewing on your annual pesticide usage.

There are exceptions under the *Pesticides Act* which may allow chemical control of invasive plants. Examples include health and safety concerns, including to public works, to protect, establish or reestablish natural resources, forestry, and agricultural practices.

If you believe that your situation falls under any of these exceptions, contact MOECC or the Ministry of Natural Resources and Forestry (MNRF) to ensure that your project meets the requirements of the exception, or to obtain a Letter of Opinion from MNRF for permission to apply Class 9 pesticides under the natural resources exception.

Any pesticide (or herbicide) treatment application must be done by a licensed exterminator, or you must hold the appropriate Integrated Pest Management certificate. If your project is in partnership with a Conservation Authority or the Ministry of Natural Resources and Forests, a Letter of Opinion may not be required.

In Urban Areas

Permits are required as per Regulation 63/09, described above. Parklands, trail systems, and private land all fall under the *Pesticides Act*.

In Rural Areas

Permits are required as per Regulation 63/09, described above. As stated, pesticides can only be applied by a company, municipality, or an individual with an operator's license as well as an exterminator's license for industrial applications. Any municipality, company or individual who is applying pesticides must also obtain and maintain their IPM Accreditation at the Ridgetown Campus of the University of Guelph.

Public Work Posting Requirements

If the extermination is performed on a portion of a highway designated as a controlled-access highway under the *Public Transportation and Highway Improvement Act*, **there are no posting requirements**, other than a portion where pedestrians have access on a regular basis or other portions where the public is invited to stop, including a rest area or picnic area. A qualified exterminator wishing to perform land exterminations on more than one residential area at the same time, may elect to provide public notice (i.e. a newspaper ad) of the exterminations as if they are performed on one application area. If there is no alternative public notice required, then a **Pesticide Use Sign** must be posted every 100 metres in a perimeter fashion. (See Reg. 63/09 for full details)

PREVENTING FURTHER CONTAMINATION AND SPREAD

- Moving un-cleaned heavy equipment containing living Phragmites plant parts from an infested site to a non-infested area, will increase the control efforts needed.

- Contaminated ditch spoil should only be disposed at a site where the material can be contained, monitored and, if necessary, treated.

- Depending upon the site, and the amount of spoil, possible disposal options include composting, burying or covering (at least 3 m of overburden), covering with heavy plastic, burning, or disposal in an agricultural or open field where emerging plants can be treated.

- Phragmites biomass may compost if it can reach temperatures greater than 57°C. This will require mixing the biomass with sufficient organic material from other sources such as animal manure.

- Phragmites mixed with mineral soil will NOT reach high enough temperatures to promote proper composting.

- Transported Phragmites material must be contained to ensure seeds or other viable plant parts do not escape while en route to the disposal site.

- If an infested ditch is to be excavated, it is highly recommended that the Phragmites be treated at least three weeks before this work is undertaken.

PREVENTING PHRAGMITES ON EXCAVATED ROADS AND DITCHES

The ditches and buffer zones of excavated roads should be seeded with a locally sourced native species seed mix. Millet can be used as a “placeholder” to prevent the establishment of Phragmites and other invasive plants before native species are established.

The benefits of seeding ditches and buffer strips with native plant species after the management of Phragmites include those mentioned in Table 1.

Table 1 Benefits of seeding ditches and buffer strips

1. Stream bank stabilization	Native grasses have extensive root systems up to 2.5 metres long, holding soil in place and preventing soil deposition into waterways.
2. Reduce mowing and spraying costs	Once established, native plants require very little maintenance.
3. Prevent re-infestation	Native plants will help to protect against re-infestation of non-native species like Phragmites.
4. Able to withstand drought	Native grasses and wildflowers are adapted to local climate and environmental conditions, allowing them to withstand drought and pest infestations.
5. Improves water quality	A riparian buffer can improve water quality adjacent to a watercourse by over 30%. It removes sediment and pollution such as chemicals, fertilizers, pesticides, bacteria, and even road salt before they reach surface water.

CLEAN EQUIPMENT PROTOCOL FOR PHRAGMITES

Why is cleaning vehicles and equipment so important?

- Construction vehicles and heavy equipment and machinery are major contributors for spreading Phragmites into new areas
- Phragmites has the ability to travel sight unseen when it becomes lodged in various parts of vehicles and equipment
- It is much more costly to control Phragmites after its establishment and spread than it is to prevent its spread
- Phragmites spread can be minimized significantly with some due diligence in inspecting and cleaning vehicles and equipment when moving from one site to another

Steps to prevent the spread and introduction of Phragmites

When working in more than one site, always try to schedule work in the sites that are the least disturbed and free of, or with the least amount of Phragmites, first, and visit sites with known Phragmites infestations last. This will greatly assist in reducing the risk of transferring plants to new locations.

1. Inspection

Regular inspection of vehicles and equipment will greatly assist in reducing the chance of spreading Phragmites.

Inspect the Equipment Before……

1. Moving out of an area of operation.

2. Moving machinery between sites, where one site has a known Phragmites infestation.

3. Using machinery along roadsides, ditches and along watercourses.

4. Visiting remote areas where access by vehicles is limited.

Also Inspect the Equipment After…..

1. Operating in "high risk" areas with a known Phragmites infestation (or after controlling a Phragmites infestation).

2. Operating in an area that you are uncertain if it contains Phragmites.

How to Inspect

1. If time permits, conduct as thorough an inspection as possible. This includes inspecting the inside and outside of the vehicle for plant material and seeds that may be lodged or adhering to interior and exterior surfaces.

2. Remove any guards, covers or plates that are easy to remove.

3. Pay attention to the underside of the vehicle, radiators, tires and foot wells.

2. When, Where and How to Clean Equipment

Cleaning is usually only required when inspection identifies visible dirt clods and plant material (plant parts and seeds may be hidden) or when moving from an infested area to a new location.

Ideally, a site for cleaning a vehicle or piece of equipment would be:

- Mud-free, gravel covered and hard – but if this is not available, try to choose a well-maintained, grassy area.

- Gently sloping to assist in draining water (if using water) and material away from the site.

- At least 30 m away from any watercourse, water body or natural vegetation.

When working in the field, it's not always feasible to find the most appropriate place to clean a vehicle or piece of equipment, therefore it's important to do the best you can with what you have.

How to Clean Equipment in the Field

If you are working in the field, or working in an area controlling Phragmites and are moving from one area to another with little cleaning equipment available, do your best to ensure large amounts of dirt, mud, plant material, etc. are removed from the inside and outside the vehicle or equipment before leaving the site.

If you <u>are</u> able to conduct a thorough cleaning in the field or when you have access to equipment which is required to thoroughly clean the vehicle or equipment, follow the steps below.

How to Clean Equipment in the Works Yard

All vehicles and equipment should undergo a more thorough cleaning when possible using these guidelines:

1. Identify areas of the vehicle that may require cleaning with compressed air rather than water (e.g. radiators and grills). Clean these areas first before using water.

2. Then, clean with a high-pressure hose in combination with a stiff brush to further remove dirt, mud and plant parts.

3. Start cleaning from the top and work to the bottom.

4. Emphasis should be placed on areas harder to clean, such as the underside of the vehicle, wheel arches, guards, radiators etc.

5. When finished, avoid driving through waste water.

6. Be cautious of where the waste water is going and try to keep it in a contained area. As mentioned above, any cleaning area should be located at least 30 m away from any watercourse, water body or natural vegetation.

PHRAGMITES TREATMENT CASE STUDY: Municipality of Lambton Shores

Background Information

All roads throughout the Municipality of Lambton Shores, including provincial, County and municipal, were surveyed for Phragmites in 2012 and 2013. Information was collected on cell locations (northing/easting, which side of the road the cell was on), approximate size, density, and proximity to residential areas and crops.

Phragmites observed in lagoons and agricultural ditches were also noted during these surveys and information for these areas is provided in section g) PMAVII (Phragmites management Area VII). There did not appear to be any discernable pattern to Phragmites cell locations, although the major roads with Arkona Line in the east, Lakeshore Road/Highway #21 to the west and Townsend Line to the south all had high cell numbers (Figure 15). In 2013, Lambton County and the MOE initiated control of Phragmites along the sections of their roads which cross through the Municipality of Lambton Shores. The municipality undertook to control their roads within the Port Franks area and West Ipperwash Road in 2012 and Ward 4 roads to the west of Lakeshore Road in 2013. These sections required assessment for required touch up efforts in 2014.

Control Information

The road surveys undertaken in 2012 were conducted by J.M. Gilbert, who identified Phragmites cells on 16 municipal roads. Additional surveys were undertaken in 2013 by L.Hayes, who located cells on an additional 15 roads. Information obtained during the 2013 survey was not available for inclusion in this document. Therefore, using the map that L. Hayes developed (Figure 15), estimates of cell numbers and sizes were made. If more than one cell was shown, it was assumed that the cells were located on both sides of the road so that control costs would not be underestimated. With the exception of the Army Camp and Ipperwash Roads, all of the roads west or northwest of Lakeshore Road and Highway #21 have been sprayed. The Municipality of Lambton Shores expressed interest in managing the remaining roads in the Ipperwash area in 2014 to coincide with plans by the local community for control efforts along the beach.

Information on the location and number of Phragmites cells observed along the Municipality of Lambton Shores roads in the Ipperwash area is summarized Table 3. As previously mentioned, the ditch along the eastern side of West Ipperwash Road was controlled in 2012. The western side of this road is on Kettle and Stony Point First Nation property and was controlled in the fall of 2013. Touch up efforts will be required for both sides of the road in 2014 and the municipality may wish to explore a potential partnership with the Kettle and Stony Point First Nation to keep this road free of Phragmites over the long term.

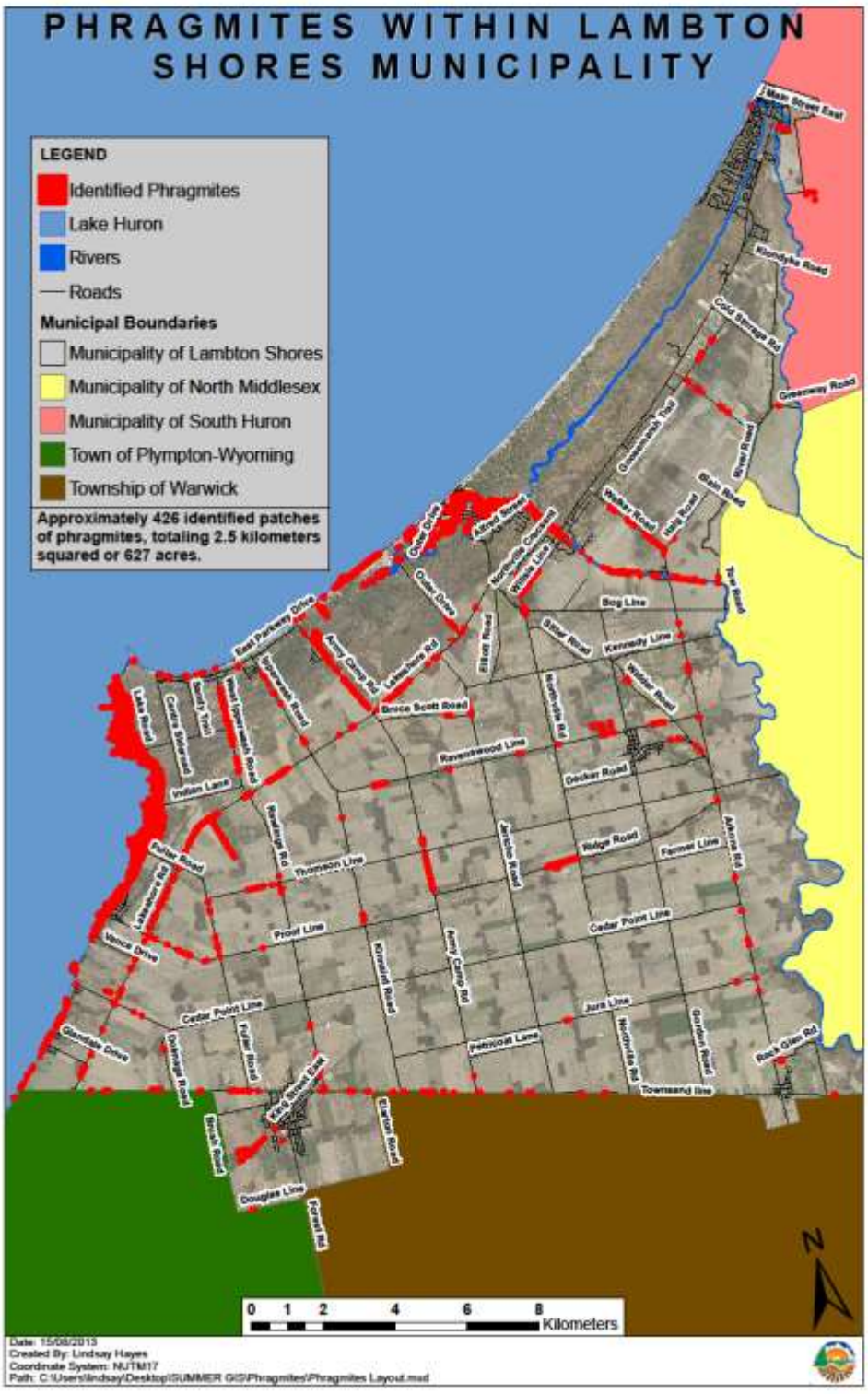


Figure 15. Location of *Phragmites* cells along roads in the Municipality of Lambton Shores.

Table 3. Summary of Phragmites cell information for the three municipal roads in the Ipperwash Beach area.

Road Name	Location	Ditch side N/S/both	Cell no.	Est. distance one way (m)	Comments
Army Camp Rd.	North of Hwy#21 to E. Parkway Dr.	both	5	3,200	cells along ~70% of road
Ipperwash Rd.	North of Hwy#21 to E. Parkway Dr.	both	11	3,100	small cells
West Ipperwash Rd.	North of Hwy#21 to Victoria Ave.	N	5	3,100	was sprayed in 2012, requires touch up

The Army Camp Road has the highest Phragmites infestation with cells starting at the Highway #21 intersection and ending ~3 km toward the lake from that point. Control efforts along the northern ditch will require a cooperative approach with the Kettle and Stony Point First Nation, since Phragmites is present on the inside of the property line for the old Army Camp and should be dealt with at the same time to reduce recontamination. Some of the cells along the southern ditch are close to residential areas and seasonal trailer parks, and the owners of these properties should be contacted prior to control actions being undertaken. Ipperwash Road has a number of smaller cells on both sides, and will be much easier to control. Suggested timing for control work on all three Ipperwash roads is after Labour Day, due to the high volume of traffic in the summer months.

Thirteen of the Municipality of Lambton Shores roads which run in roughly a north to south direction were found to have Phragmites along them (Table 4). The most heavily infested of these roads was Arkona Road, Army Camp Road south of Highway #21, and Indian Hills Trail. Six of these roads had only one or two small cells present. The roads with Phragmites cells running in roughly an east to west direction included Main Street on the outskirts of Thedford and King Street West heading out of Forest (Table 5). Both of these roads had four cells present, and four roads had only one or two cells present. The most heavily infested roads were Ravenswood Line, Proof Line, Ridge Road and Bog Line.

Table 4. Summary of Phragmites cell information for the municipal roads which run in a north to south direction throughout the MLS.

Road Name	Location	Ditch side E/W/both	Cell no.	Est. distance one way (m)	Comments
River Road	Between Blain Rd. and Bog Line	E	1	3,700	sparse ~5mx20m
Haig Rd.	Between Walker Rd and Blair Rd	unknown	1	2,025	L.H. data
Goosemarsh Trail	Between Greenway Road and Cold Storage Rd.	unknown	2	2,045	L.H. data
Arkona Rd.	Between Townsend Line and Walker Rd.	both	12	15,280	numerous small cells
Widder R.	Between Arkona Rd. and Gordon Rd.	unknown	4	2,380	L.H. data
Willsie Line	From Northville Rd. to Eric St.	both	4	1,610	~1/2 distance has cells
Northville Rd.	From Hwy #21 to Bog Line	both	2	1,005	small cells
Jericho Rd.	Between Ravenswood Line and Kennedy Line	unknown	3	2,065	
Army Camp Rd.	Between Townsend Line and Hwy#21	both	4	10,905	3 small, 1 long cell ~1km
Kinnaird Rd.	Between Ravenswood Line and Proof Line	unknown	3	3,740	L.H. data
Indian Hills Trail	West off Lakeshore Rd. dead end	unknown	1	1,200	L.H. data
Fuller Rd.	Between Thomson Line and Proof Line	E	5	2,855	cells combined ~1.5km
Dolmaga Rd.	Between Cedar Point Line and Townsend Line	unknown	1	1,810	L.H. data

L.H.= Lindsay Hayes data on file at MLS office

Table 5. Summary of Phragmites cell information for the municipal roads which run in an east to west direction throughout the MLS.

Road Name	Location	Ditch side N/S/both	Cell no.	Est. distance one way (m)	Comments
Greenway Rd.	Between Mun. S. Huron border and Goosemarsh Trail	unknown	8	4,290	L.H. data
Walker Rd.	Between Haig Rd. and Goosemarsh Trail	unknown	5	2,435	L.H. data
Bog Line	Between Northville Rd. and Tow Rd.	both	10	5,620	numerous small cells
Bruce Scott Rd.	Entire length	unknown	2	2,570	L.H. data
Ravenswood Ln	Between Kinnaird Rd. and Arkona Rd.	unknown	12	10,260	L.H. data
Main St., Thedford	Between Decker Rd. and Third St.	both	4	1,505	small cells
Thomson Line	Between Rawlings Rd. and Fuller Rd.	S	3	2,080	2 small, 1 long cell ~0.5km
Proof Line	Between Lakeshore Rd. and Rawlings Rd.	both	11	2,195	numerous small cells
Cedar Point Line	Between Lakeshore Rd. and Dolmaga Rd.	S	2	1,725	small cells
King St. W. Forest	Up to Brush Rd.	unknown	4	2080	L.H. data
Jura Line	Between Jericho Rd. and Arkona Rd.	both	3	6,210	small cells
Douglas Line	Between Brush Rd. and Forest Rd.	unknown	1	1,885	
Rock Glen Rd.	Between Arkona Rd. and Ann St.	unknown	2	290	L.H. data
Ridge Rd.	Between Jericho Rd. and Northville Rd.	unknown	11	2,060	L.H. data

L.H.= Lindsay Hayes data on file at MLS office

Due to funding constraints, it is probably not feasible or reasonable to expect control of all of the roads to occur in the same year. The roads have therefore been ranked in terms of priority, to provide a guide to targeting as funds become available (Table 6). The highest priority is given to those roads with cells closest to Lake Huron or rivers and streams. High priority is also given to roads with cells of high density, mature plants, in order to reduce seed dispersal. Control cost estimates were calculated for each road using the current rates for ditch spraying. Included in the cost factoring was the number of cells, cell size estimates, and the mileage to be travelled. Cell sizes varied from ~2 m wide and 5 m long up to ~5 m wide and 9,500 m long. When cell sizes were not available, a median size value was used in the calculation. When cell locations were not available and more than one cell was present on a road it was assumed that both sides of the road had to be treated, which doubled

the cost estimates. The roads that have already been controlled in the Port Franks and Ward 4 areas were not included in these cost estimates.

The roads estimated to require the highest costs to control are Arkona Road at ~$15,900, Army Camp Road (south of Highway #21) at ~$11,100, and Ravenswood Line at ~$11,000. These high cost estimates are due to the number of cells, the fact that the cells are located on both sides of these roads, and the distance which must be travelled to control the entire road. The roads could be divided into smaller sections to allow for some measure of control when funds are not available to control the entire stretch.

Table 6. Priority ranking and estimated associated costs for Phragmites control of MLS roads.

Road Name	Priority	Est. cost	Comments
Army Camp Rd. N of Hwy #21	high	$3,450	Will require partnership with KSPFN to be most effective
Ipperwash Rd.	high	$3,650	Priority due to proximity to beach and interior swales
West Ipperwash Rd	high	$ 500	Touchup required
River Rd.	high	$1,900	Close proximity to Ausable River cut
Walker Rd.	high	$2,700	Close proximity to Ausable River cut
Haig Rd.	high	$2,100	Close proximity to Ausable River cut
Willsie Line	high	$1,670	Close proximity to Ausable River cut
Northville Rd.	med	$1,100	Close proximity to Ausable River cut
Bog Line	high	$6,100	Close proximity to Ausable River cut
Indian Hills Trail	high	$1,250	Close proximity to creeks flowing to lake
Thomson Line	high	$1,300	Close proximity to creeks flowing to lake
Proof Line	high	$2,750	Close proximity to creeks flowing to lake
Cedar Point Line	high	$1,000	Close proximity to creeks flowing to lake
Fuller Rd.	high	$1,700	Close proximity to creeks flowing to lake
Greenway Rd.	high	$4,700	Close proximity to river
Arkona Rd.	med/high	$15,900	Eastern boundary of MLS and ditch connected to interior
Ridge Rd.	med/high	$2,600	Many cells with mature plants
Army Camp Rd. S of Hwy #21	med/high	$11,100	Many cells with mature plants
Goosemarsh Trail	med	$2,150	Should be controlled with Greenway Road
Widder Rd.	med	$1,390	Should be controlled at same time as Main St., Forest
Ravenswood Line	med	$11,000	Should be controlled with cells on adjacent farm land
Main St., Thedford	med	$1,710	Should be controlled with Ravenswood Line east
Bruce Scott Rd.	med	$2,700	Should be controlled with Jericho Rd.
Jericho Rd.	med	$2,200	Should be controlled with Bruce Scott Rd.
Kinnaird Rd.	med	$3,900	Few cells that could be controlled quickly
King St. W., Forest	med	$2,280	Should be controlled with lagoons and other cells in Forest
Dolmaga Rd.	med	$1,900	Control costs could be lower if done with Cedar Pt. Line
Rock Glen Rd.	med	$ 250	Control costs low if done at same time as Arkona Rd.
Jura Line	med	$6,400	Control cost inflated due to travel distance
Douglas Line	med	$1,940	Control cost inflated due to travel distance

Cost estimates are for the initial control efforts. For all but the small, sparse cells, touch up work can be anticipated. Touch up could take place during the same year as the initial control or the following

year. Cost estimates for any required touch up will have to be obtained from potential contractors. It can be anticipated that control costs would be highest during the first year, be substantially reduced for touch up work and reach a minimal annual or bi-annual cost thereafter.